Botanical Resources Report
Sheep Creek Vegetation Management Project

La Grande Ranger District
Wallowa Whitman National Forest

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Executive Summary

This report, also called a Botanical Resources Report, is a Biological Evaluation for sensitive plants in a proposed project area on the La Grande Ranger District of the Wallowa Whitman National Forest. It documents the anticipated effects resulting from the proposed Sheep Creek Vegetation Management Project on 24 sensitive plant species, which were determined to fall within the elevation and distribution ranges of the approximately 30,000-acre project area. All other sensitive plants known or suspected on the La Grande Ranger District, are not suspected to occur within the project area, and therefore are not included in the analysis. The following bullets present a brief summary of findings (see Table 1 for species-specific findings):

- No federally listed (threatened or endangered) or candidate plant species are known to occur on the La Grande Ranger District. No plants or suitable habitat were found in the project area during field surveys. There will be **No Effect** to any federally listed (threatened or endangered) or candidate plant species from this project. One species, known from the project area, was recently proposed for listing as threatened under the Endangered Species Act. Until this proposed species receives a federal listing, it will be analyzed as a Forest Service sensitive species.
- In total, six species of Forest Service sensitive plants were documented in the project area. Project design criteria and mitigation measures will limit potential impacts to known sensitive plant sites. For these species, proposed activities **may impact individual plants or habitat but will not likely contribute to a trend toward federal listing, or loss of viability**.
- 18 other Forest Service sensitive plant species were determined to have potential habitat within the project area during a pre-field review. None of these were found during extensive field surveys. Due to the size and complexity of the project area, these species are included in this analysis, because there is still a small potential to inadvertently impact undiscovered populations or suitable habitat. Accordingly, the proposed activities **may impact individual plants or habitat but will not likely contribute to a trend toward federal listing, or loss of viability.**
- In the long-term this project is expected to increase the quality and quantity of habitat for many sensitive plant species in the project area. These beneficial effects would come as a result of project activities reducing risk of high intensity wildfires and helping to restore complexity in forest composition and structure.

Table 1: 24 Sensitive plants documented or suspected in Sheep Creek Vegetation Management Project and the effects of project activities

Scientific Name[1]	Common Name	Project Area Occur[2]	No Action Effects[3]	Alternative 2 Effects[3]	Alternative 3 Effects[3]
Nonvascular plants, lichens, and fungi					
Albatrellus avellaneus	N/A	HD	NI	MIIH	MIIH
Pseudorhizina californica	Umbrella false morel	D	NI	MIIH	MIIH
Schistidium cinclidodonteum	Schistidium moss	HD	NI	MIIH	MIIH
Tritomaria exsecta	Little brownwort	HD	NI	MIIH	MIIH
Vascular plants, lichens, and fungi					
Achnatherum richardsonii	Richardson's needlegrass	D	MIIH	MIIH	MIIH
Botrychium ascendens *crenulatum* *lunaria* *paradoxum* *penduculosum*	Moonwort species	HD	NI	MIIH	MIIH
Botrychium crenulatum	Scalloped moonwort	D	MIIH	MIIH	MIIH
Botrychium montanum	Mountain grape-fern	D	MIIH	MIIH	MIIH
Carex cordillerana	Cordilleran sedge	HD	NI	MIIH	MIIH
Cryptantha simulans	Pine woods cryptantha	HD	NI	MIIH	MIIH
Cypripedium fasciculatum	Clustered lady's-slipper	HD	NI	MIIH	MIIH
Diphasiastrum complanatum	Ground cedar	HD	NI	MIIH	MIIH
Dracocephalum parviflorum	American dragonhead	HD	NI	MIIH	MIIH
Eleocharis bolanderi	Bolander's spikerush	HD	NI	MIIH	MIIH
Listera borealis	Northern twayblade	D	NI	MIIH	MIIH
Ophioglossum pusillum	Adder's-tongue	HD	NI	MIIH	MIIH
Penstemon pennellianus	Blue Mountain penstemon	HD	NI	MIIH	MIIH
Phacelia minutissima	Dwarf phacelia	HD	NI	MIIH	MIIH
Phlox multiflora	Many-flowered phlox	HD	NI	NI	NI
Pinus albicaulis	Whitebark pine	D	MIIH	BI	BI
Trifolium douglasii	Douglas' clover	HD	NI	MIIH	MIIH

1Sensitive species from Regional Forester's List

2Occurrence

HD - Habitat Documented or suspected within the project area or near enough to be impacted by project activities
D - Species **Documented** in general vicinity of project activities

3Effect Determinations for Sensitive Species

NI - No Impact
MIIH - May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend towards Federal Listing or Cause a Loss of Viability to the Population or Species
WIFV - Will Impact Individuals or Habitat with a Consequence that the Action May Contribute to a Trend towards Federal Listing or Cause a Loss of Viability to the Population or Species
BI - Beneficial Impact

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Introduction

This report addresses the potential effects of the proposed Sheep Creek Vegetation Management Project on federally listed (threatened or endangered), proposed, and candidate plant species. It also addresses plant species designated as sensitive on the most recent Forest Service Region 6 Regional Forester's Special Status Species List (USDA 2019). Species designated as sensitive are those for which there are conservation concerns and for which special management considerations may be implemented (USDA 2019).

All species designated by the U.S. Fish and Wildlife Service (USFWS) as federally listed, proposed, or candidate are also included on the Forest Service Region 6 Regional Forester's Special Status Species List (USDA 2019). Taxa included on this list and addressed in this report are:

- vascular plants (i.e. ferns, gymnosperms, and flowering plants)
- non-vascular plants (i.e. mosses and liverworts)
- lichens
- fungi (i.e. mushrooms)

These taxa are collectively referred to as sensitive plants. This report presents existing information on sensitive plants and their habitats in the project area. It also describes the anticipated direct, indirect, and cumulative effects resulting from each of the three alternatives proposed in the Sheep Creek Vegetation Management Project.

Project Description

The Sheep Creek Vegetation Management Project is located on the La Grande Ranger District of the Wallowa Whitman National Forest. Treatments proposed under this project are designed to move forest conditions from their current structure and development trajectory to conditions that more closely reflect natural disturbance regimes. Strategies for restoring forest structure and function include using a combination of commercial, non-commercial, and prescribed fire to reduce the risk of high intensity wildfires and enhance forest health. The La Grande Ranger District developed alternatives to address issues concerning the proposed action's potential to result in adverse effects on the natural and human environment (as summarized in Table 2).

Table 2. Brief Summary of Alternatives

Sheep Creek Vegetation Management Project Area: 29,935 Acres	
Alternative	**Description**
Alternative 1-No Action	Under this alternative, no proposed activities would be pursued. Ecological succession would continue along its current trajectory. This demonstrates the baseline for conditions to compare action alternatives, resource effects, and trends.
Alternative 2-Modified Proposed Action*	Developed to respond to issues which arose during the scoping period regarding treatments in Riparian Habitat Conservation Areas (RHCAs), treatments in Old Forest Multi Story, and sale economics. These modifications promote accelerated restoration of Old Forest Single Story and RHCAs and improve sale economics. It differs from the proposed action by including additional commercial harvest acres above the initial proposed action. Actions include: • commercial harvest- 3,385 acres • non-commercial treatment- 8,376 acres • prescribed fire- 9,521 acres
Alternative 3-Reduced Action*	Developed to respond to issues which arose during scoping regarding wildlife habitat and treatments in moist forests. This alternative differs from the proposed action by reducing the total acres of treatment and eliminating prescriptions that remove the highest basal area, commercial treatments in RHCAs, and commercial harvest in connectivity corridors. Actions include: • commercial harvest- 1,322 acres • non-commercial treatment- 6,087 acres • prescribed fire- 9,521 acres

* Action alternatives (alternatives 2 and 3) also include road work, including temporary road construction, road maintenance, road decommissioning, road reconstruction, and culvert replacement.

Affected Environment

Pre-field Review

A pre-field review was done to determine the likelihood of sensitive plant populations and their suitable habitat within the project area. Habitat requirements for each of the sensitive plant species were compared with habitats occurring in the project area using:

- geographic information system (GIS) mapping layers (e.g. vegetation, soils, streams, wetlands, and aerial imagery)
- project-specific GIS layers (e.g. proposed treatment areas)
- proximity to known sensitive plant populations provided by the Oregon Biodiversity Information Center, the Consortium of Pacific Northwest Herbaria, and the Wallowa Whitman National Forest inventory of known sensitive plant populations

117 plant species from the Forest Service Region 6 Regional Forester's Special Status Species List are known or suspected to occur in the Wallowa Whitman National Forest (Appendix A: Wallowa Whitman Sensitive Plant List). Of these, 24 were determined to fall within the elevation and distribution ranges of the project area and have habitat that could be affected by project activities. Table 3 provides existing information on these sensitive plant species and their habitats as well as an assessment as to the likelihood of each occurring in the project area.

The habitat descriptions are adapted from Hitchcock and Cronquist's Flora of the Pacific Northwest (Hitchcock and Cronquist 2018), The Field Guide to Selected Rare Plants of the Umatilla National Forest (Brooks 2020), and from professional observations by local botanists.

Table 3: Sensitive plants with suitable habitat within the Sheep Creek Vegetation Management Project

Scientific Name	Common Name	Habitat Descriptions	Sheep Creek Project Assessment
Nonvascular plants, lichens, and fungi			
Albatrellus avellaneus	N/A (fungus)	Fruits infrequently in the fall on soil in moist coniferous forests. Associated with hemlock, Douglas fir, and spruce.	Habitat could exist; but difficult to locate species due to ephemeral nature.
Pseudorhizina californica	Umbrella false morel (fungus)	Grows on or adjacent to well-rotted stumps and logs. Also found on soil along streams, skid trails, and recently disturbed soil.	Discovered in project area in 2020.
Schistidium cinclidodonteum	Schistidium moss	Not much known about this species. Forms mats on rocks often along intermittent streams at moderate to high elevations. Often on calcareous rock. Could include ponderosa pine forest type.	Possible but not likely to have suitable habitat in the project area.
Tritomaria exsecta	Little brownwort (liverwort)	In mesic to somewhat xeric wooded habitats from sea level to 6,500 feet. Substrates include humic soil over rock or rock crevices, rotten wood, and tree trunks.	Very limited habitat and distribution information. It is possible to be present in mesic to xeric habitats in the project area.
Vascular plants			
Achnatherum richardsonii	Richardson's needlegrass	Grasslands, sagebrush steppe, open woodlands, often on sandy or gravelly substrates.	Discovered in project area in 2020.
Botrychium ascendens, crenulatum, lunaria, paradoxum, penduculosum	Moonworts	Moist meadows, riparian zones, moist roadsides, openings in cold forests. Often in calcareous soils, but not always. Lower montane, mesic coniferous forests, and grassy fields. Often on the drier edges of wet meadows.	Several populations known in the project area.
Botrychium montanum	Mountain grape-fern	Dark, coniferous forests, usually near swamps and streams. Wet meadows, saturated soils. Often growing in a bed of mosses. This species tends to grow in wetter sites than the other *Botrychium spp.*	Several populations known in the project area; One new population discovered in 2020.
Carex cordillerana	Cordilleran sedge	Riparian terraces, mesic forests, with grand fir and Douglas fir. Aspen forests. Rocky slopes, in leaf litter and duff. Ecotones between conifer stands and grasslands especially around ninebark and other shrubs.	Majority of populations on the Forest are in the Wallowa Mtns, but there is one population 5 miles north of the project area in a riparian area like those found in the project area. Probability within the project area is moderate.
Cryptantha simulans	Pine woods cryptantha	In open ponderosa pine forests. Reported on open rocky slope at Baldy Mtn, in Elkhorn Mountains.	Unlikely, but possible on higher rocky sites in the project area.

Cypripedium fasciculatum	Clustered lady's-slipper	Grand fir to ponderosa pine, and warm riparian forests. Generally, in 60-100% shade. Often w/mountain lady's slipper.	Unlikely, but possible. Very rare in NE Oregon.
Diphasiastrum complanatum	Ground cedar	Dry open coniferous or mixed dry to wet forest slopes, or in riparian areas. Often on rotting logs, or in thick duff. Reportedly also in meadows and on open ridge tops.	The only population known from the Wallowa Whitman NF is located 2.5 miles east of the project area. Probability within the project area is moderate.
Dracocephalum parviflorum	American dragonhead	Open, often moist places from the foothills to moderate elevations in the mountains; seeds require fire or other disturbance for germination.	No recent fire history in project area. Probability is low.
Eleocharis bolanderi	Bolander's spikerush	Vernally wet swales, along intermittent streams, and in wet depressions in moist meadows. In slight depressions that hold snow later in the season than surrounding areas. Surrounding forest is usually ponderosa pine.	Unlikely, but possible in unit 102.
Listera borealis	Northern twayblade	In moist, rich humus of mossy coniferous forest, swamps, often along cold streams, acidic soils. Most known sites are in older forests. Associated tree species include spruce, true firs, and Doug fir. Moderate elevations.	Discovered in the project area in 2020
Ophioglossum pusillum	Adder's-tongue	Seasonally wet areas in pastures, old fields, roadside ditches, bogs, fens, wet meadows, flood plains, moist woods, grassy swales, dry or damp sand, dry hillsides, acidic soil.	Most populations in Region 6 are known from the Cascades Mtns. Probability within the project area is low.
Penstemon pennellianus	Blue Mountain penstemon	Open forest on ridge tops to rocky or gravelly slopes at moderate elevations. In road cuts and shallow lithosols.	Rare in NE Oregon and SE Washington. Probability within the project area is low.
Phacelia minutissima	Dwarf phacelia	Moist, open places, streambanks, meadows, ephemerally moist swales. Vernally moist openings in ponderosa pine or Doug fir forest.	Probability within the project area is moderate. Does not produce above-ground plants every year so could be difficult to detect in surveys.
Phlox multiflora	Many-flowered phlox	Basalt cliffs, rocky outcrops and bluffs, rocky openings and wooded rocky areas in dry forest. Sometimes on loose substrate as well as cracks in cliffs and rock outcrops.	Only known on the Forest from the Grande Ronde River drainage. Probability within the project area is low.
Pinus albicaulis	Whitebark pine	Subalpine, usually near timberline. Usually fairly dry sites with thin, rocky, cold soils.	Discovered in the project area in 2020
Trifolium douglasii	Douglas' clover	Moist or mesic meadows, prairie remnants, along riparian areas along streams. In swales, along intermittent streams, and in vernally wet areas. Alluvial soils, ash/clay, fine silt to sandy.	Historic records from approximately 3 miles northwest of project area. Probability within the project area is moderate.

Six of the sensitive plant species from the pre-field review were found (or relocated) in the project area. Each of these species will be analyzed individually. For the other 18 species that were not found during field surveys, but that have suitable habitat in the project area, potential project impacts will be discussed using a habitat-based approach. This methodology treats potential project impacts on seven "sensitive plant suitable habitat types" as a proxy for the potentially undocumented sensitive plants within. These habitat types will be explained in more detail later in this report. Figure 1 in the Methodology section will also provide a visual representation of this.

Field Surveys

Information from the pre-field review was used to determine the need for, and intensity of, botanical surveys that were then conducted during the 2020 field season (June through August). The intensity of field surveys was designed to be proportionate with the perceived level of risk of impacting sensitive plants with proposed activities. Approximately 55% of the units proposed for commercial harvest, 30% of the units proposed for precommercial harvest, and 25% of the units proposed for prescribed fire were surveyed. The areas selected for field surveys were prioritized based on two factors: (1) the highest potential for supporting the 24 sensitive plant species identified in the pre-field review, and (2) surveying a representative sample of habitat types across the project area.

The type of survey used was the "intuitive control" method. This method relies on the judgment of an experienced sensitive plant surveyor to guide the survey. Priority areas determined in the pre-field review were set using course filters, but sensitive plants are often found within specific microhabitats within these larger sites. This survey type allows the surveyor to use their expertise to identify fine-scale microhabitats to focus their survey on, instead of covering entire priority areas evenly.

Documented Sensitive Plant Species

Federally Listed (Threatened or Endangered), Proposed, or Candidate Plant Species

There is no potential habitat within the project area for the following federally listed (threatened or endangered) or candidate plant species: *Mirabilis macfarlanei (*MacFarlane's four o'clock) and *Silene spauldingii* (Spalding's catchfly). These will not be discussed further as there will be **No effect (NE)** from project activities to these species.

Whitebark pine (*Pinus albicaulis*) was proposed for listing on December 2, 2020. The U.S. Fish and Wildlife Service's proposal to list whitebark pine as threatened under the Endangered Species Act [proposed rule 50 CFR 17] was based on the results of a rigorous Species Status Assessment involving review of the best available science. Whitebark pine occurs in the project area. Until this proposed species receives a listing status, it will be analyzed as a Forest Service sensitive species.

Forest Service Sensitive Plants

Six Forest Service sensitive plant species are documented in the project area (Table 4): umbrella false morel (*Pseudorhizina californica*), Richardson's needlegrass (*Achnatherum richardsonii*), scalloped moonwort (*Botrychium crenulatum*), mountain moonwort (*Botrychium montanum*), northern twayblade (*Listera borealis*), and whitebark pine (*Pinus albicaulis*).

Sensitive plant populations have been historically detected and recorded using a variety of equipment and surveying protocols. The resulting variability in the data can make it challenging to compare numbers. Therefore, the number of populations and the number of acres are included in Table 4.

Table 4: Sensitive plants documented in Sheep Creek Vegetation Management Project

Scientific Name	Common Name	Wallowa-Whitman NF		Project Area	
		# populations	# acres	# populations	# acres
Nonvascular plants, lichens, and fungi					
Pseudorhizina californica	Umbrella false morel	1	0.6	1	0.6
Vascular plants					
Achnatherum richardsonii	Richardson's needlegrass	4	29,327	3	12,060
Botrychium crenulatum	Scalloped moonwort	15	621	1	0.3
Botrychium montanum	Mountain moonwort	82	81	6	0.8
Listera borealis	Northern twayblade	5	1.7	1	0.4
Pinus albicaulis	Whitebark pine	572	1,433 [*] 365,273 estimated [**]	1	1,331

[*]In the FS database, most of the whitebark pine populations are mapped as points instead of polygons. This accounts for the large number of populations and relatively small number of acres. Most of the mapped acres across the Forest were mapped in 2020 in the project area. Generally, when mapping sensitive plant populations, there is a default minimum separation distance of 1 km between individual populations. However, whitebark pine populations in the database are mostly not adhering to this standard (NatureServe 2020).

[**]Because the # acres of whitebark pine in the FS database is inaccurate, a habitat suitability model (made specifically for whitebark pine) was applied. From this model, the highest probability habitat (>70% probability) was used to generate an estimate of the total number of whitebark pine acres across the Forest.

Background Information

Additional background information about the ecology of the six sensitive plant species found in the project area is summarized below.

Umbrella false morel (Pseudorhizina californica)

Umbrella false morel can be found throughout Western North America from British Columbia to northern California and east to the Rocky Mountains (Loring 2020). This fungus forms associations with fine root systems of plants. If those structures are damaged, a reduction in local population size or local extinction can result (Loring 2020). As such, threats to this species include management activities that would result

in the loss of potential host species; compaction or other soil disturbances; removal or destruction of fungal organisms; and the removal of litter, duff, and coarse woody debris (Cushman and Huff 2007; Loring 2020). Significant alterations of the microclimate (e.g. loss of canopy cover or reduction in moisture levels) have also been identified as threats to this species (Cushman and Huff 2007).

Scalloped and mountain moonworts (Botrychium crenulatum and B. montanum)
The geographic range of scalloped moonwort is limited to marshy and spring areas in California, Oregon, Washington, Idaho, Nevada, Arizona, Utah, Montana, and Wyoming (Wagner and Wagner 1981). While the geographic range of mountain moonwort is scattered across the western United States, British Columbia, and Alaska but is rare throughout its distribution (Fryer 2014).

There is limited information about the habitat requirements, environmental tolerances, and the effects of management on moonwort species. Actions that change the existing site characteristics, disturbance regimes, or physically disturb the soil and potentially damage roots and fungal associations are recommended to be avoided. Activities such as off-road vehicle use, timber harvesting, exotic plants and herbicides, fire suppression, and road maintenance can pose threats to these species.

To establish, most moonwort species require a disturbance regime in which a 10-30 year disturbance cycle is maintained. Management that promotes and maintains suitable habitat available for colonization by spores and the development of new populations should be encouraged. However, it is important to maintain known sites, as they are the source of spores that will create new populations. Additional considerations may include maintaining existing canopy cover, maintaining conditions that sustain mycorrhizal diversity, avoiding disturbance of above ground plants or substrate (e.g. duff layer and moss), avoiding excessive siltation or deposition of soil, and providing early to mid-seral habitat (Ahlenslager and Potash 2007).

Richardson's needlegrass (Achnatherum richardsonii)
Richardson's needlegrass is a perennial bunchgrass that is known from British Columbia, Alberta, Saskatchewan, and parts of Yukon Territory south through Montana to Colorado and west to eastern Washington. Scattered populations occur in the Black Hills of South Dakota (Esser 1992). Previously there was only one recorded population of Richardson's needlegrass in Oregon located approximately, 27 air miles southwest of La Grande on a slope above Squaw Creek (CPNWH 2020). There is limited literature on Richardson's needlegrass range wide, but we are further limited in our understanding about the ecology of this species in this region. According to the recently published Field Guide to the Grasses of Oregon and Washington (Roche et al. 2020) Richardson's needlegrass is easily disturbed by livestock grazing, suggesting that it might not tolerate other disturbances well.

No specific information on adaptations of Richardson's needlegrass to fire were found during a literature review. However, in general, perennial needlegrasses are among the least fire resistant of the bunchgrasses because they have relatively shallow root systems (Wright et al. 1979). Season of burn, plant size, and fire intensity all contribute to needle grasses' ability to survive fire. Midsummer fires tend to result in the most needlegrass mortality. Older plants are also highly susceptible because successive years of accumulation of dead leaves makes them vulnerable to heat being transferred below the soil surface, damaging roots, and killing the plants. It has been found, that while moderate to high intensity fires have high mortality rates for perennial needlegrasses, they often survive low intensity fires (Wright and Klemmedson 1965).

Northern twayblade (Listera borealis)
The range of northern twayblade extends from Utah and Colorado north to Wyoming, Idaho, Oregon, Washington, and Montana and further north into Canada and Alaska (Magrath and Coleman 2002). Threats to this species include activities that change microsite characteristics including canopy cover, continuous moss cover, hydrology, and loss of older forests (Salstrom and Gamon 1993). Mechanical

damage related to off-road driving, timber harvest, road construction, and fire line construction have been identified as threats to this species. Disturbances associated with grazing-related impacts have also been identified as threats (Alexander 2016).

Another factor to consider for northern twayblade is competition for resources with invasive understory species (Burzynski 2013). Climate change and associated events such as high-intensity wildfires could also drastically alter canopy cover and limit viable habitat for this plant. Lastly northern twayblade is suspected, judging from information known about similar species, to require a long time to complete its growing cycle. It is suspected that it can require several years before producing a photosynthetic stem and another dozen or more years before a plant will produce a flowering stem (Salstrom and Gamon 1993).

Whitebark pine (Pinus albicaulis)

Whitebark pine is a slow-growing, shade intolerant, long-lived tree occurring on high-elevation or high-latitude sites in western North America. Two broad but split distributions exist with one following the Sierra Nevada, Coast, and Cascade ranges while the other follows the Rocky Mountains (Fryer 2002). In Oregon, isolated stands of whitebark pine are known from the Blue and Wallowa Mountains in northeastern Oregon and the Cascade and Klamath Mountains in south-central Oregon (USDI 2019).

Whitebark pine forests are declining throughout their range. White pine blister rust, a non-native fungal disease, is harming whitebark pine trees across the American West. Mountain pine beetles, altered wildfire patterns, and climate change are also negatively affecting the species (Keane et al. 1990; Tomback et al. 2001). These factors led scientists to conclude that after decades of decline, an estimated 51% of all standing whitebark pine trees were dead as of 2016 (Goeking and Izlar 2018).

Whitebark pine can grow within a broad upper elevation zone but it is a poor competitor (Keane et al. 2012). In the project area, populations of whitebark pine seedlings and saplings, were discovered growing at the species' lower elevational limit. No mature seed-producing trees were found. Whitebark pine seeds can be transported 20 miles or farther, often to these lower subalpine sites, by Clark's nutcrackers (Lorenz et al. 2011). The dispersal of seeds from nutcrackers occurs across much greater distances than dispersal by wind. Thus, resulting in high genetic diversity (Rogers et al. 1999; Tomback et al. 1990). This high genetic diversity may facilitate local adaptation and whitebark pine resilience in the climates of the future. Some studies have suggested that under climate change scenarios, whitebark pine may increase at these lower portions of the subalpine (Coops and Waring 2011).

Sensitive Plant Suitable Habitat Types

As previously described, field surveys were designed to locate sensitive plants at a level proportionate to the level of risk from project activities. However, the scale of the project and the complexity of the species with potential habitat in the project area, provide reason to analyze for sensitive plants that were not detected in field surveys but that have suitable habitat within the project area. For more information on this rationale, see the Assumptions section of this document.

Sensitive plants tend to grow in specialized habitats. Others occur in transition zones between habitat types. Since there are 18 species that were not found during field surveys, but that have suitable habitat in the project area, it is more efficient to describe them in terms of the broader habitat types where they may occur, rather than describe each individual species.

For this analysis, plant communities and special habitats have been grouped into habitat groups called "sensitive plant suitable habitat types". Some of these are more wide-ranging and are based on the Blue Mountain Potential Vegetation Groups (Powell et al. 2007) while others are based on specific landscape features (e.g. streams and rock outcrops). Each sensitive plant species identified in the pre-field review has been assigned to one or more habitat type (refer to Figure 1). Only habitats present in the project area that have the potential to support sensitive plants are discussed and analyzed (summarized in Table 5).

Table 5: Sensitive Plant Suitable Habitat Types in Sheep Creek Vegetation Management Project

Habitat Types	Description	Number of Acres in Sheep Creek Project		
		Project Area	Alt 2*	Alt 3*
Cold and/or Moist Upland Forest (UF)	Cold and moist forests are grouped together for this analysis because there is significant overlap in the sensitive plant species they can support. Cold forests occur in moderate to high elevations of the subalpine zone, while moist forests occur at moderate elevations of the montane zone and low elevations of the subalpine zone. Moist UF are bordered by cold UF at their upper edge, and by dry UF at their lower edge (Powell 2013). Disturbance regimes in both cold and moist forests have been significantly altered from widespread anthropogenic changes which have created more homogenized conditions in these forest types, thereby degrading potential sensitive plant habitat.	20,346	7,884	4,258
Dry Upland Forest (UF)	Dry forests are in low to moderate elevations of montane zones. In the Blue Mountains, dry UF are subdivided into warm and hot temperature regimes (Powell 2011). Historically, these sites would have featured a low-severity, high frequency fire regime (every 5-20 years) (Agee 1996; Hall 1976, 1980). This habitat type has seen extensive fire exclusion which has led to changes in species composition, forest structure and stand density (Powell et al. 2007; Powell 2011), thereby altering potential sensitive plant habitat in dry upland forests.	8,214	3,690	3,117
Warm Riparian Forest/ Shrublands	Warm riparian communities include aspen, cottonwood, and shrubs such as mountain alder, willow species, currant species, chokecherry, and dogwood. These communities are usually less than 40 acres in size and are primarily found along bands along stream banks, wetland areas, and intermittently wet draws. The fire frequency interval is not well established though some research has indicated similarities to adjacent uplands (Olsen 2000). Fire exclusion, that has resulted in conifer encroachment, has been linked to declines in this habitat type (USDA Forest Service 1996; Quigley et al. 1997). Grazing has also altered the structure of warm riparian forests and shrublands. These management actions have the potential to alter hydrological processes and thus alter the quality of sensitive plant habitat.	No good metric for calculating these acres. Totals are included within RHCAs which are under the Aquatic Habitats, Intermittent & Perennial Streams category.		
Bunchgrass Meadows, Dry Shrublands, & Lithosols	Bunchgrass meadows, dry shrublands, and lithosols (scablands) are habitats with very shallow soils on poorly weathered basalt or andesitic bedrock. While the soils can be saturated following spring snow melt, they dry quickly and are exposed to full sun for the entire growing season. Invasive species are very common in this habitat type in the project area. Many invasive plants compete with sensitive species and can reduce their abundance and distribution. Invasive plants can also indirectly affect sensitive species by degrading their habitat through the alteration of fire or nutrient regimes.	559	48	39
Cliffs & Rock Outcrops	Cliffs and rock outcrops have vertical faces where very few plants can survive. Because these habitats are largely composed of bedrock or accumulations of rock, they are assumed to be in good condition with a stable trend. The nature of this habitat group means it has been avoided with most management activities. The main exception to this is when these areas are used for rock sources.	32	3	0
Springs and Seeps & Moist and Wet Meadows	Springs are points where groundwater emerges and flows. Groundwater also feeds seeps, but seeps do not produce perennial flow. Springs and seeps are typically small but are well distributed on the Wallowa-Whitman National Forest. These areas provide important habitat for several sensitive plant species. Moist meadows are typically saturated in the spring, but by mid to late summer the water table has fallen below the soil surface. Wet meadows are saturated throughout the growing season with the water table at or slightly below the soil surface. These non-forested openings have experienced conifer encroachment and hydrological changes from past management in the Sheep Creek project planning area.	512	36	36
Aquatic Habitats, Intermittent & Perennial Streams	Aquatic and intermittent & perennial stream habitats are collectively defined by high soil moisture and/or running water. There are several significantly different aquatic and riparian plant communities (Warm Riparian Forests/Shrublands are analyzed separately but acres are included together because of insufficient data to differentiate between the two). Though the plant communities differ, the forest plan manages these habitats similarly under direction for Riparian Habitat Conservation Areas (RHCAs).	6,213	1,118	875

* In harvest units

Methodology

Figure 1, below, shows the two distinct methodologies that were used to analyze the 24 species identified in the pre-field review. All other sensitive plants known or suspected on the Wallowa Whitman National Forest, are not suspected to occur within the project area therefore are not described and will not be

included in the analysis [as per 40 CFR 1500.1(b)]. For a complete list of sensitive plants occurring on the Wallowa Whitman National Forest, see Appendix A: Wallowa Whitman Sensitive Plant List.

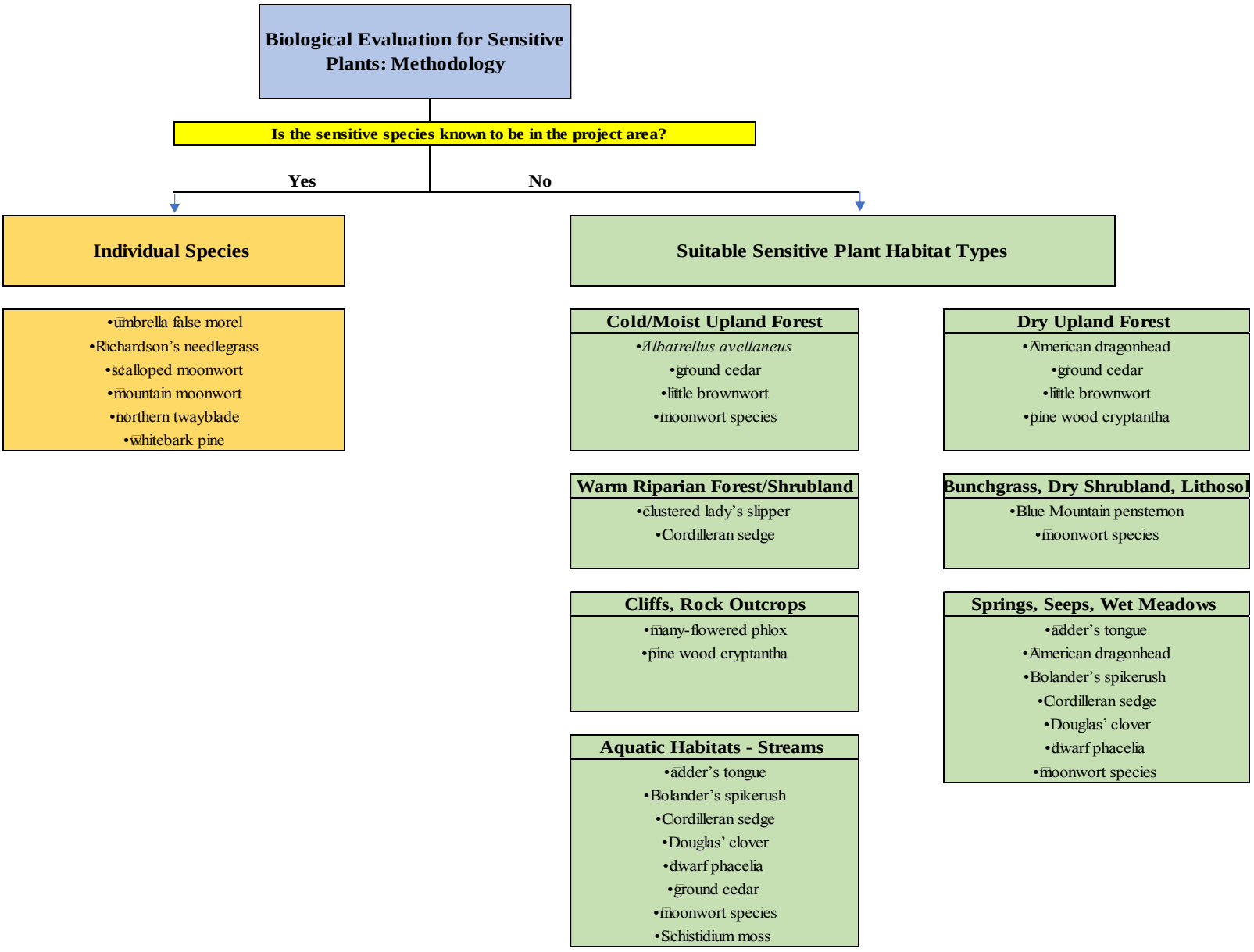

Figure 1: Evaluation methodologies for the 24 sensitive plant species known and suspected from the Sheep Creek Vegetation Management Project

Measurement Indicators

The following Indicators and Measures summarized in Table 6 were selected to evaluate the project alternatives for effects to: 1) the six known sensitive plants in the project area (i.e. Individual Species

method) and 2) to the seven sensitive plant suitable habitat types present in the project area (i.e. Suitable Sensitive Plant Habitat Types method).

Table 6: Resource indicators and measures for assessing effects

Analysis Question	Indicator	Measure	Source (law, regulation, policy)
What are the effects of the proposed activity on the viability of sensitive plant populations?	**1) Impacts to known sensitive plant populations:** Changes to population resilience within the project area, from proposed activities*	a) % of known populations** with effects from ground disturbance b) % of known populations with effects from prescribed fire c) % of known populations with effects from changes in light availability d) % of known populations with effects from changes in water availability	Wallow Whitman LRMP Pages 4-30-4-31
	2) Impacts to suitable sensitive plant habitats: Change in acres of suitable habitat across the project area	a) # acres with changes in ground disturbance b) # acres with changes in prescribed fire c) # acres with changes in available light d) # acres with changes in available water	Forest Service Manual 2670

***** For this analysis, population resilience is assumed, based off professional judgement, to be affected when > 20% of a sensitive plant's known area of occurrence would be negatively influenced by project activities.

***Known populations* refers to either the extent of the species within the project area or the extent of the species across the Wallowa Whitman National Forest. See Spatial Context below for a description of when each spatial scale is applied.

Spatial and Temporal Context for Effects Analysis

The spatial boundary selected for analyzing effects to sensitive species is defined as the extent of each species within the project area. If potential impacts are possible, then populations on the Wallowa Whitman National Forest are used to determine if the effects of the project will lead to a declining trend across the Forest. Based on this, the extent of each species within the project area was used to analyze all the sensitive plants in this analysis except for Richardson's needlegrass (*Achnatherum richardsonii)*. For this species the populations across the Wallowa Whitman National Forest were used.

The temporal context for this analysis includes short-term and long-term effects. Short-term effects are limited to one to two years after project implementation. These short-term effects are generally caused by direct effects such as ground disturbance or incineration. Long-term effects are considered to persist over a time greater than two years. These long-term effects are generally caused by indirect effects such as changes in sunlight, hydrology, and potential changes in animal grazing patterns and intensity.

Assumptions

While field surveys were conducted at a level commensurate with the level of risk from project activities, not all treatment areas were surveyed. See Field Surveys for description of survey prioritization and survey methods. The level of surveys completed was enough to support the completion of the analysis of effects and for the development of mitigation measures to protect sensitive plant viability.

For this analysis it is assumed that there are potentially undiscovered populations of sensitive plants that could be impacted by project activities. This assumption is the result of: (1) the scale of the Sheep Creek Vegetation Management Project (approximately 30,000-acres) and (2) the complexity of the species with potential habitat in the project area.

The only two sensitive fungi currently known in the Wallowa Whitman National Forest are the umbrella false-morel (*Pseudorhizina californica*) and a polypore called *Albatrellus avellaneus* (USDA 2019). Fungi only fruit under very specific moisture, pH, light, and temperature conditions (Cushman & Huff 2007). Therefore, it is difficult to locate these species due to their ephemeral nature. It is possible that there are undocumented populations of umbrella false-morel and *Albatrellus avellaneus* in the project area.

Some sensitive plant species do not produce above-ground plants every year. These plants include some perennial species like moonworts (*Botrychium* spp.) (Fryer 2014) and many annual species which are dependent upon enough early spring rains (Rees and Long 1992). Suitable habitat was identified in the pre-field review for three sensitive annual species: pine woods cryptantha (*Cryptantha simulans*), least phacelia (*Phacelia minutissima*), and American dragonhead (*Dracocephalum parviflorum*). It is therefore possible that surveys may not detect these plants in years when conditions do not favor germination. Additionally, many of the non-vascular plants are very difficult to identify; it is possible that even expert botanists may overlook some of these species (Whitton and Rajakaruna 2001).

Information Gaps

There are no empirical studies on the short-term and long-term effects of forest management actions to many of the sensitive plant species that occur in the Wallowa Whitman National Forest. Therefore, discussion of potential impacts to sensitive plants and habitats is based upon professional experience, observations, and studies of impacts to similar common species.

Additional information gaps for the species and habitats in this analysis include:

- Exact or complete distribution and range information
- Population trends
- Fungal associates, their habitat requirements, and the role they play in sensitive plant's ecology
- Effective management areas and habitat characteristics necessary to maintain known sensitive plant sites
- Methods for categorizing high likelihood habitat (to best prioritize surveys and ensure appropriate habitat conservation)

Environmental Effects

Direct, Indirect, & Cumulative Effects of No Action (Alternative 1)

Impacts to Documented Sensitive Plant Species

There would be no direct effects for the no action alternative for **umbrella false morel, Richardson's needlegrass, scalloped moonwort, mountain moonwort, northern twayblade,** and **whitebark pine** in the project area**.**

Current population viability, trends, habitat conditions and threats to these sensitive species would persist. Under this alternative there would be indirect and enduring negative effects to whitebark pine, Richardson's needlegrass, and moonwort species. For **whitebark pine (*Pinus albicaulis*)**, the absence of the whitebark pine enhancement treatments could decrease habitat because of increased shade and competition from other more fast-growing conifers**. Richardson's needlegrass (*Achnatherum richardsonii)***, which appears to favor partial sunlight, would likely continue to be shaded out without thinning treatments aimed at reducing lodgepole pine densities. **Moonwort species (*Botrychium spp*.)** may experience indirect negative effects because they are often dependent upon frequent disturbance in their habitat. A lack of substantial disturbance, and increased shade from conifers, could reduce the overall potential moonwort habitat in the area in the long-term. **Umbrella false morel** and **northern twayblade** are not expected to have any indirect negative effects from this alternative.

Because no management would occur, there would be no effects to add to ongoing or future actions that would contribute cumulative effects for any of the sensitive plant species known from the project area.

In conclusion, Richardson's needlegrass, scalloped moonwort, mountain moonwort, and whitebark pine will potentially have effects from the no action alternative that **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability**. Umbrella false morel and northern twayblade will have **No Impact** from this alternative.

Continued Trends to Suitable Sensitive Plant Habitat Types

Under this alternative there is expected to be no direct or indirect effects to undetected populations of the 18 sensitive species not known from the project area. Any potential impacts to undetected populations are unlikely as these plants have a low likelihood to occur in the analysis area and would be small; therefore, the cumulative impacts would not increase significantly. **No Impact** is expected from this alternative. However, current trends, and potential threats to sensitive plant habitats, are expected to continue. The anticipated trends to the seven sensitive plant suitable habitat types are summarized below.

Cold and/or Moist Upland Forest

Under the no action alternative, cold and moist upland forests would continue to trend toward landscape simplification, thereby potentially providing less habitat for sensitive plants. Under the no action alternative, forests with less ecological heterogeneity are also more vulnerable to large, high severity fire and insect outbreaks (Stine et al. 2014).

Dry Upland Forest

Under the no action alternative, dry upland forests would see continued fuel loading, potentially resulting in forests less resilient to disturbance (Powell et al. 2007), and therefore potentially able to provide less habitat for sensitive plants. The sensitive species that have the potential to occupy this habitat type are most likely adapted to fire regimes characterized by light, non-stand-replacing fires and might experience damage from large high intensity fires.

Warm Riparian Forest/Shrublands

Under the no action alternative, the quantity and quality of warm riparian forest and shrublands in the project area would either decrease or remain at current levels.

Bunchgrass Meadows, Dry Shrublands, and Lithosols

Under the no action alternative, bunchgrass meadows, dry shrublands, and lithosols are likely to continue to experience encroachment of lodgepole pine and of ponderosa pine (in areas of deeper soil), resulting in decreases of understory native bunchgrasses, and decreased forb composition.

Cliffs and Rock Outcrops

Under the no action alternative, cliffs and rock outcrops would likely see little change over time.

Springs and Seeps & Moist and Wet Meadows

Under the no action alternative, springs and seeps would see little change over time. Wet meadows are likely to continue to experience conifer encroachment. Additionally, restoration work including fencing around wet meadows and planting native broadleaf vegetation would not occur.

Aquatic Habitats, Intermittent and Perennial Streams

Under the no action alternative, aquatic habitats would likely continue to have a lack of shade producing and diversity-enhancing riparian vegetation.

Direct and Indirect Effects of Action Alternatives (2 & 3)

Discussions of the action alternatives are combined because the effects to sensitive plants and their habitats would be similar.

Design Features and Mitigation Measures Common Across Action Alternatives

The following bullets present a summary of the design features and mitigation measures relevant to botanical resources for both action alternatives. For a complete list see Sheep Creek Vegetation Management Project Management Requirements, Constraints and Mitigation Measures.

- Exclude known sensitive plant population locations from ground disturbing treatments by implementing a no-disturbance buffer around each site.
- Avoid ground disturbing activities on previously undisturbed non-forested terrain.
- Follow Forest Plan and Regional guidelines for including weed spread prevention measures in implementation contracts and for using native species for restoration and erosion control work.
- Exclude project fire ignition within Riparian Habitat Conservation Areas (RHCAs); but low intensity prescribed fire would be allowed to back into these areas. Follow Forest Plan standards and guidelines for protecting RHCAs from ground disturbing activities. This habitat type is where many sensitive plants can occur.
- Rehabilitate landings and skid trails after completion of timber harvest activities where needed to minimize colonization by undesirable plant species and to minimize bare soil
- Mitigations developed specifically for **Richardson's needlegrass** and **whitebark pine** are presented below.

Impacts to Documented Sensitive Plant Species

Umbrella false morel (Pseudorhizina californica), scalloped and mountain moonworts (Botrychium crenulatum and B. montanum) and northern twayblade (Listera borealis)

To protect these species, known population locations will be excluded from treatments by implementing a no-disturbance buffer around each site of a size adequate to provide protection from implementation impacts. Known occurrences will be depicted as Areas-to-Protect (ATPs) on implementation maps. Based on the Indicators and Measures that were identified for this analysis, 0% of the known populations of umbrella false morel, scalloped and mountain moonworts, and northern twayblade would be negatively affected by ground disturbance, prescribed fire, changes in light availability, or changes in water availability. However, it is unlikely, but possible that there are undiscovered populations of these species in the project area that could be inadvertently impacted by project activities. Thus, the effect for both action alternatives (2 and 3) for these species is **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability.**

Treatments proposed under both alternatives have the potential to promote habitat conditions suitable for colonization by moonwort (*Botrychium* spp.) spores and the development of new populations where there currently are none. Thus, moonwort species, which require early seral habitats to establish, have the potential to benefit from the implementation of treatments under the action alternatives.

Richardson's needlegrass (Achnatherum richardsonii)

Several large populations of Richardson's needlegrass were discovered in dry upland forests within the project area during 2020 field surveys. This resulted in the development of a series of mitigations to reduce potential impacts from the action alternatives. Both alternatives include 153 acres of Areas-to-Protect (ATPs) from a total of 16 units. ATPs were selected based on the following criteria: (1) highest abundance of Richardson's needlegrass and (2) geographic areas that would provide good seed sources for reestablishing populations outside of ATPs where treatments are proposed to still occur.

Overlapping design criteria from other resource areas, seed collection for reseeding areas with the greatest amount of soil disturbance, and adaptive management (trying prescribed burning in both spring and fall to see which has a more favorable response) will also reduce potential impacts to Richardson's needlegrass. Additionally, monitoring will be incorporated as part of this project because this species is considered very rare in Oregon and little is known about its ecology. The information obtained from monitoring will be used in the adaptive management strategy and to help inform future management decisions.

Table 7 compares the alternatives using the Indicators and Measures identified for this analysis. Following the table, the measures (i.e. ground disturbance, prescribed fire, available light, and available water) are discussed.

Table 7: Resource indicators & measures for assessing effects on Richardson's needlegrass

Analysis Question/Issue	Indicator	Alternative 2	Alternative 3
What are the effects of the proposed activity on the viability of Richardson's needlegrass?	Changes to population resilience from proposed activities	9% of known populations across the Forest with effects from ground disturbance 19% of known populations across the Forest with effects from prescribed fire 10-20% of known populations across the Forest with effects from changes in light availability 0% of known populations across the Forest with effects from changes in water availability	8% of known populations across the Forest with effects from ground disturbance 19% of known populations across the Forest with effects from prescribed fire 10-20% of known populations across the Forest with effects from changes in light availability 0% of known populations across the Forest with effects from changes in water availability

The proposed ground-disturbing treatments have the potential to affect approximately 9% for alternative 2 and 8% for alternative 3 of the Richardson's needlegrass known area of occurrence. For this analysis, population resilience is assumed to be affected when > 20% of a sensitive plant's known area of occurrence would be negatively influenced by project activities. Although there will be individual plants that will be impacted, there will not be a substantial change in population resilience from ground disturbing treatments. Additionally, project design criteria will further reduce impacts to this species by requiring reseeding areas where there has been heavy soil disturbance with a native seed mix. This seed mix will include a component of Richardson's needlegrass seed collected pre-implementation from within the project area.

Prescribed fire has the potential to affect approximately 19% of the Richardson's needlegrass known area of occurrence for either action alternative. Richardson's needlegrass that occurs within proposed fire units are expected to maintain viable populations due to timing of prescribed fires, the species' adaptations to often survive low-intensity fire, and habitat conditions and project design criteria that prevent the intensity of fire necessary to damage populations. Therefore, although some individual plants might be incinerated, there will not be a substantial change in population resilience from prescribed fire.

Project activities will alter light availability for approximately 10-20% of the Richardson's needlegrass known area of occurrence for both action alternatives. This species was observed in highest abundance in areas where there was approximately 20-40% shade cover in mixed conifer forest of predominantly lodgepole pine. Areas where shade cover increased Richardson's needlegrass was most often observed where there were open pockets of sunlight furthest from the surrounding trees. Therefore, the changes in light availability are expected to have a positive impact on population resilience.

Richardson's needlegrass was observed in the project area in dry upland forests. Neither action alternative is expected to substantially change the hydrology in this habitat type. Therefore, project activities will not

have a substantial change in population resilience for Richardson's needlegrass as a result of changes in the hydrologic conditions.

Thus, these actions **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to populations of Richardson's needlegrass**. In the long term, the proposed actions are expected to benefit this species as the treatments will reduce fuel loading, promote landscape diversity, maintain and encourage a more natural disturbance cycle, and provide for more available light to the understory.

Whitebark pine (Pinus albicaulis)

Populations of whitebark pine seedlings and saplings, ranging in height from less than a foot to 15-feet tall, were discovered in subalpine habitat during 2020 field surveys. There were no mature, cone producing whitebark pine located. These findings resulted in the development of the proposed action to include whitebark pine mitigations and restoration activities. These actions include whitebark pine protection areas, hand-thinning of competing conifers, and developing and implementing a plan to plant rust resistant seedlings in priority management units. The whitebark pine protection areas will be identified prior to implementation of any treatments. Within these areas, hand-thinning of competing conifers to help enhance existing whitebark pine individuals will occur but no mechanical equipment will be allowed. Mitigation measures also include that < 20% of whitebark pine's known area of occurrence within the project area will be negatively influenced by project activities.

Table 8 compares the alternatives using the Indicators and Measures that were identified for this analysis. Following the table, the measures (i.e. ground disturbance, prescribed fire, available light, and available water) are discussed separately.

Table 8: Resource indicators & measures for assessing effects on whitebark pine

Analysis Question/Issue	Indicator	Action Alternatives (2 & 3)
What are the effects of the proposed activity on the viability of whitebark pine?	Changes to population resilience from proposed activities*	< 20% of known area of occurrence within the project area effects from ground disturbance < 20% of known area of occurrence within the project area effects from prescribed fire 50-70% of known area of occurrence within the project area with effects from changes in light availability 0% of known area of occurrence within the project area with effects from changes in water availability

With mitigation measures in place, the proposed ground-disturbing treatments will affect less than 20% of whitebark pine's known area of occurrence within the project area for either action alternative. Where the prescription is hand thinning, there will be very limited effects of ground disturbance to whitebark pine because implementation will be designed to protect this species. Individual whitebark pine seedlings, in mechanical treatment units (but outside of the whitebark pine regeneration protection areas) may be impacted. However, there will not be a substantial change in population resilience from the ground disturbing treatments because of the mitigation measures put in place. Additionally, the hand-thinning of competing conifers should enhance the ability of whitebark pine to reach maturity in the project area.

Prescribed fire will affect less than 20% of whitebark pine's known area of occurrence within the project area for either action alternative. Therefore, although individual whitebark pine seedlings might be top killed, there will not be a substantial change in population resilience from prescribed fire. Additionally, whitebark pine that occurs within proposed fire units are expected to maintain viable populations due to design criteria preventing direct ignition in whitebark pine regeneration protection areas and due to the low intensity of the prescribed fire proposed.

Project activities are expected to increase light availability for approximately 50-70% of whitebark pine's known area of occurrence within the project area for either action alternative. Whitebark pine is a shade intolerant species and is at risk of being successionally replaced by subalpine fir or other shade-tolerant species in the absence of disturbances or treatments. Therefore, the changes in light availability from proposed treatments are expected to have a positive impact on whitebark pine population resilience.

Whitebark pine was observed in the project area in cold upland forests, the hydrology is not expected to change substantially in this habitat type. Therefore, project activities will not have a measurable change in population resilience of whitebark pine as a result of changes in the hydrologic conditions.

In conclusion, with mitigations, both the short and long term effects of the proposed actions should have a **Beneficial Impact** on whitebark pine as the treatments will promote the vigor of whitebark pine regeneration by reducing competition from other more fast growing conifer species and by maintaining and encouraging a more natural disturbance cycle.

Impacts to Sensitive Plant Suitable Habitat Types

Table 9 uses the Indicators and Measures to compare the proposed action alternatives for effects to suitable sensitive plant habitat (using changes in acres of suitable habitat as a proxy for the effects to potentially undocumented sensitive plants within).

Following the table, the measures (i.e. changes in ground disturbance, prescribed fire, available light, and available water) are discussed specific to each of the seven suitable sensitive plant habitat types.

Table 9: Resource indicators & measures for assessing effects from changes in acres of suitable habitat

Indicator	Measures		Suitable sensitive plant habitat types*						
	Alterative 2	Alternative 3	Cold & Moist UF	Dry UF	Warm Riparian Forest/ Shrub	Bunchgrass, Dry Shrub & Lithosol	Cliff & Rock	Spring & wet meadow	Aquatic & Stream
Change in acres of suitable habitat, across the project area	11,680 acres with changes from ground disturbance	7,455 acres with changes from ground disturbance	X	X	X				X
	9,521 acres with changes from prescribed fire	9,521 acres with changes from prescribed fire	X	X	X				
	Up to 11,680 acres with changes in available light	Up to 9,521 acres with changes in available light	X	X	X	X		X	X
	1,154 acres with measurable changes in available water**	911 acres with measurable changes in available water**			X			X	X

* An (X) indicates that actions are proposed to occur within that habitat type and are included within the total acreages presented on the table for each alternative.

** Calculated as the total number of acres of RHCA-Wetland and RHCA Thinning treatments.

Cold and/or Moist Upland Forest

Actions proposed to take place in cold and moist upland forests include various road actions, commercial harvest, noncommercial thinning, post-harvest treatments, and prescribed fire. Even though alternatives 2 and 3 differ in the total acres of moist upland forest treatments, the alternatives are discussed together because the overall effects to the sensitive plants that may occupy this habitat type would be similar.

The actions proposed may have limited negative direct effects from ground disturbance and prescribed fire on the sensitive plants that can occupy this habitat type. This is due to acute disturbances to undocumented plants, disturbances to suitable habitat from heavy machinery, and possible incineration from prescribed fire.

Proposed actions may also have limited negative indirect effects on any undocumented shade tolerant species due to altering the amount of light reaching the understory. However, actions may have a beneficial effect for other species of sensitive plants that require less canopy cover. Additional indirect effects would likely be beneficial, as the treatments would reduce fuel loading, help to restore heterogeneity to these forests, and promote a healthy herbaceous understory. Additionally, various road actions (e.g. road maintenance, road decommissioning, road reconstruction, and culvert replacement) in this habitat type would repair hydrological processes adjacent to the road. Restoration of these processes could create more habitat suitable for sensitive plants that thrive in moist forests.

Based on this assessment, sensitive plants that can occupy cold and/or moist upland forest will potentially have effects from project activities in the action alternatives that **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability.**

Dry Upland Forest

Actions planned for dry upland forests in alternatives 2 and 3 include the same actions as those discussed for cold and moist upland forests (i.e. various road actions, commercial harvest, noncommercial thinning, post-harvest treatments, and prescribed fire). These actions may have limited negative direct effects on sensitive plants that can occur in this habitat type. This is due to (1) ground disturbances, potentially resulting in physical damage to undocumented plants and disturbances to suitable habitat from machinery or tree felling and (2) prescribed fire, potentially resulting in top-kill of individuals of undocumented sensitive plants.

A reduction in shade due to logging and thinning may indirectly impact shade tolerant sensitive plants. However, treatments are expected to benefit other sensitive plant species that may inhabit these areas. Treatments would create more heterogeneity across dry forests, which have become oversimplified because of past management. Other indirect effects would likely be beneficial because the treatments would reduce fuel loading and potentially prevent catastrophic fires that could destroy sensitive plant habitat. The hydrologic conditions are not expected to change significantly in this habitat type.

Thus, sensitive plants that can occupy dry upland forest will potentially have effects from project activities in the action alternatives that **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability**.

Warm Riparian Forest/Shrublands

The treatments proposed for both action alternatives in warm riparian forests and shrublands (i.e. RHCA-Riparian Thinning) would involve variable thinning around deficient cottonwood, aspen, willow, and early seral tree and shrub species. These treatments would occur by hand unless material could be removed with total suspension and the equipment does not have to leave existing roadbeds. These treatment practices would greatly reduce the amount of ground disturbance in this habitat type. There is a small possibility that felled trees would physically fall on undocumented sensitive plants during implementation, but the treatments would produce indirect, long-term benefits. Fuels treatments would likely have no effect on riparian forests and shrublands because design criteria would prohibit direct ignition in this habitat type. Additionally, because of the water requirements of riparian shrub species, it is unlikely that prescribed fire would carry through this habitat.

The addition of woody material to the meadow and riparian systems could indirectly prevent some ungulate access, potentially resulting in lower risk from herbivory and trampling. Additionally, adding wood to the channels within meadows would attenuate the flow of water, reducing erosion and downcutting through the system, potentially raising the water table and re-connecting the hydrology. Both factors could indirectly contribute to the increase in quality and quantity of sensitive plant habitat in warm riparian forests and shrublands.

Thus, sensitive plants that can occupy warm riparian forests and shrublands will potentially have effects from project activities in the action alternatives that **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability**.

Bunchgrass Meadows, Dry Shrublands, and Lithosol

Project design criteria to protect potential sensitive plant habitats would avoid ground disturbing activities (e.g. piling slash, decking, motorized travel, parking, staging operations, and temporary road creation) on previously undisturbed non-forested terrain. This would protect specialized habitats within bunchgrass meadows, dry shrublands, and lithosols that provide habitat for diverse plant species. Additionally, design criteria to protect shallow soils and meadows would prevent heavy equipment use or allow it to be permitted only over dry or frozen ground. Prescribed fire activities have the potential to directly harm undocumented sensitive plants within this habitat type if heat is transferred below the soil surface. This has the potential to damage roots and kill plants. However, season of burn, burn intensity, and design criteria would limit potential negative effects.

Changes in available light and water will be limited to the edges of open areas that are adjacent to treatment units. The changes are expected to have a negligible indirect effect to sensitive plants that can occupy this habitat type. Many invasive plants compete with sensitive species and can reduce their abundance and distribution. Invasive plants can also indirectly affect sensitive plants by degrading their habitat by changing fire or hydrologic processes. Invasive species are very common in this habitat type in the project area. The potential for additional spread of invasive species is higher in treatment areas. This project includes prevention measures to minimize the risk of introduction and spread of invasive plants during project implementation (described in the Sheep Creek Invasive Plants Report). These measures are expected to mitigate risks and maintain or decrease existing noxious weed infestations in this habitat type in the project area.

Thus, sensitive plants that can occupy bunchgrass meadows, dry shrublands, and lithosols will potentially have effects from project activities in the action alternatives that **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability.**

Cliffs and Rock Outcrops

Very few human activities have potential for direct or indirect impacts to this habitat type. Additionally, design criteria would protect these areas from ground disturbing activities. Prescribed fire generally does not burn in this habitat type due to the low fuel levels. Therefore, the implementation of alternatives 2 and 3 should have no direct or indirect effects to cliffs and rock outcrops or to any sensitive plant species that may occur there.

Based on this assessment, proposed activities from the action alternatives will have **No Impact** on sensitive plants that can occupy cliffs and rock outcrops.

Springs and Seeps & Moist and Wet Meadows

To protect soil and water resources, most activities would be greatly restricted in identified groundwater dependent and wetland habitats. These are biodiversity hotspots and can support many sensitive species present in the Wallowa Whitman National Forest. Both action alternatives include RHCA-Wetland enhancement treatments. Wetland enhancement includes hand thinning small encroaching conifers, fencing around wet meadows, and planting native broadleaf vegetation.

Many project design criteria would limit the use of heavy equipment and minimize ground disturbance in these communities. Design criteria would also prevent prescribed fire ignition within floodplains, RHCAs, and seeps, springs, and wet meadows. This would protect sensitive plants that may occur in this habitat type. In the long term, the treatments near and within this habitat type should benefit sensitive plants by reducing conifer encroachment (which have altered the available light and moisture to the ground in these habitats) and by improving hydrological processes.

Thus, sensitive plants that can occupy springs/seeps, and moist/wet meadows will potentially have direct effects from project activities in the action alternatives that **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability**. However, indirect and long-term effects will likely benefit these species.

Aquatic Habitats, Intermittent and Perennial Streams

Actions proposed in aquatic habitats and streams include RHCA- HTH Riparian Thinning under both action alternatives. RHCA thinning treatments would involve hand thinning and removal or felling of conifers within this habitat type. Design criteria prohibit certain activities (including the use of mechanical equipment) in these habitats. This should limit the direct effects from ground disturbance to any undocumented sensitive species. To protect sensitive plants from deleterious thermal effects of fire, project fire ignition would not occur within RHCAs; but low intensity prescribed fire would be allowed to back into these areas. With these restrictions in place, fire would likely have limited effects on sensitive plants in this habitat type. The long-term impacts would change the hydrology and shade levels in these ecosystems. This could help restore and maintain suitable habitat for supporting sensitive plants.

Thus, sensitive plants that can occupy aquatic habitats and streams will potentially have effects from project activities in the proposed action alternatives that **may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability**.

Cumulative Effects of Action Alternatives

A list of present and reasonably foreseeable future activities within the project area, and on immediately adjacent public and private lands are described in Sheep Creek Vegetation Management Appendix D Cumulative Effects Analysis Process and Project Area Activities. This list serves as a guide for analyzing the cumulative effects of implementing the Sheep Creek Vegetation Management Project.

Road Maintenance – there is ongoing road maintenance in and near the project area. This may result in some increase in localized disturbances to sensitive plants and in potential increases to invasive plant abundance. This could continue to contribute to small scale adverse impacts to sensitive plants in the project area.

Grazing – there are active grazing allotments within the project area (Sheep Ranch, Limber Jim, and Chicken Hill Allotments). It is possible that activities proposed under this project (e.g. harvest and prescribed burning) could open suppressive vegetation and promote the growth, abundance, and vigor of sensitive plants making them more available and desirable to livestock. Conclusive information as to the growth habits and on the effects of management actions is largely unknown for the sensitive plants known/suspected in the project area. It is not expected that this project will result in cumulative effects from potential changes in grazing patterns due to the design criteria in place. But, if observations/monitoring indicate an adverse impact, timing of grazing is an activity within the control of grazing allotment administration and can be incorporated into annual operating instructions.

Recreational Use – the project area currently has high levels of recreational use, and recreation is expected to increase. Areas with high concentrations of recreational use are vulnerable to disturbances which could result in inadvertent trampling of sensitive plants in the project area.

Other Fuels Management—adjacent to the project area other vegetation management projects have occurred and have the potential to continue to occur on private lands. These have the potential to impact sensitive plants.

Overall, the cumulative impact of management activities upon sensitive plant population viability are expected to be low. Sensitive plant surveys have been conducted and potential impacts to the known Richardson's needlegrass, scalloped and mountain moonwort, northern twayblade, and whitebark pine,

have been addressed through mitigation measures and project design features. Any potential impacts to undetected populations of the 18 sensitive species not known from the project area are unlikely as these plants have a low likelihood to occur in the analysis area and would be small; therefore, the cumulative impacts would not increase significantly.

Regulatory Consistency

The Sheep Creek Vegetation Management Project has been reviewed and was determined to comply with the regulatory framework applicable to botanical resources. The laws, regulations, policies and Wallowa Whitman National Forest Land and Resource Management Plan (LRMP) requirements/guidance applicable to this project and this resource are listed below in Table 10.

Table 10. Regulatory framework applicable to botanical resources in the Sheep Creek Project

Forest Plan Standards
Threatened and Endangered and Sensitive Species (p. 4-30 thru 4-31)
(1) Review all actions and programs, authorized, funded, or carried out by the Forest Service, to determine their potential effects on threatened, endangered, and sensitive species. Conduct these reviews, including biological evaluations, per direction in FSM 2670 and appropriate Region 6 manual supplements.
(2) Protect and manage habitat for the perpetuation and recovery of plants which are listed as threatened, endangered, or sensitive. To assure that management activities do not jeopardize the continued existence of sensitive species or result in adverse modification of their essential habitat.
Forest Service Manual – FSM 2670.32
(1) Review programs and activities as part of the National Environmental Policy Act of 1969 process through a biological evaluation, to determine their potential effect on sensitive species.
(2) Avoid or minimize impacts to species whose viability has been identified as a concern.
(3) Analyze, if impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.
Forest Service Manual – FSM 2672.41
Ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or contribute to trends toward Federal listing of any species.
Endangered Species Act of 1973
Federal agencies are to ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered, threatened or proposed species, or result in the destruction or adverse modification of designated critical habitat.

Monitoring Recommendations

Project design criteria should provide sufficient protection to sensitive plant populations and potential habitat in the project area, despite potential short-term negative impacts due to ground disturbance and prescribed fire. However, implementation monitoring is recommended for Richardson's needlegrass and whitebark pine for this project. Monitoring would be beneficial to document the response of these two species to treatments, validate assumptions about cumulative effects, and inform future management decisions.

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